

Claims

What is claimed is:

- [c1] A reaming tool, comprising:
a body having reaming blades affixed thereto at azimuthally spaced apart locations around a circumference of the body, the reaming blades each having at least one cutter attached thereto at selected positions and orientations on each of the blades to minimize a net lateral force developed by the reaming tool, the body adapted to couple to a drill string at both axial ends thereof; and
a pilot hole conditioning section comprising a plurality of azimuthally spaced apart pilot blades affixed the body longitudinally ahead of the reaming blades.
- [c2] The reaming tool as defined in claim 1 wherein the pilot blades each include a taper at a downhole end thereof, the pilot blades each including a gauge pad having a diameter substantially equal to a drill diameter of a pilot bit used to drill a pilot hole longitudinally ahead of the reaming tool, at least one intermediate cutter affixed to selected ones of the pilot blades longitudinally behind the gauge pad, the at least one intermediate cutter laterally positioned to drill a hole having an intermediate diameter larger than the pilot hole and smaller than a drill diameter of the reaming tool, and an intermediate gauge pad having a diameter substantially equal to the intermediate diameter.
- [c3] The reaming tool as defined in claim 2 further comprising at least one auxiliary cutter disposed on selected ones of the taper on the pilot blades to improve drill out of float equipment.

- [c4] The reaming tool as defined in claim 2 wherein at least one of a position and an orientation of the at least one intermediate cutter is selected so that the reaming tool generates a net lateral force less than about twenty percent of an axial force applied to the reaming tool.
- [c5] The reaming tool as defined in claim 2 wherein at least one of a position and an orientation of the at least one intermediate cutter is selected so that the reaming tool generates a net lateral force less than about fifteen percent of an axial force applied to the reaming tool.
- [c6] The reaming tool as defined in claim 2 wherein selected ones of the blades on the pilot hole conditioning section comprise unitized structures with azimuthally corresponding ones of the reaming blades.
- [c7] The reaming tool as defined in claim 1 wherein selected ones of the reaming blades comprise a spiral structure.
- [c8] The reaming tool as defined in claim 1 wherein an outermost surface of each of the reaming blades conforms to a radially least extensive one with respect to a longitudinal axis of the reaming tool of a pass through circle and a drill circle, the drill circle substantially coaxial with the longitudinal axis, the pass-through circle axially offset from the drill circle and defining an arcuate section wherein the pass-through circle extends from the longitudinal axis past the drill circle, so that radially outermost cutters disposed on ones of the reaming blades positioned azimuthally within the arcuate section drill a hole having a drill diameter substantially twice a maximum lateral extension of the reaming blades from the longitudinal axis while substantially avoiding wall contact along an opening having a diameter of the pass through circle.

- [c9] The reaming tool as defined in claim 8 wherein ones of the reaming blades disposed azimuthally outside the arcuate section comprise wear resistant inserts on laterally outermost surfaces thereof.